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cies.' " The second and third parts of the work are upon those portions of Scripture which bear upon the origin of mankind.

Dr. A. A. Gould alluded to the alleged fossil human bones from the upper part of Florida, and expressed the opinion of himself, and others who had examined the localities, that they had no claim to be considered as fossil bones.

The Corresponding Secretary read a letter from the Geological Society of London, acknowledging the reception of Vol. V. Part. I. of the Academy's Memoirs. Also letters from the Verein für Vaterlaendische Naturkunde, at Würtemberg, and the Société des Sciences Naturelles de Cherbourg, requesting an exchange of publications with the Academy; the latter Society had already sent one volume of its publications, in octavo.

Three hundred and ninety-ninth meeting.

April 25, 1854. — SEMI-MONTHLY MEETING.

The PRESIDENT in the chair.

Letters were read from the Ethnological Society of London, Rear-Admiral Smyth, and the Breslau Akademie der Naturforscher, acknowledging the reception of Vol. V. Part I. of the Academy's Memoirs; letters from the K. K. Geologische Reichsanstalt of Vienna, and the Académie Royale des Sciences de Stockholm, acknowledging the reception, the former of Vol. IV. Part. II., and the latter of Vol. V. Part I. of the Academy's Memoirs, and transmitting also donations of their publications in exchange; and letters from the Royal Institution of London, the Akademie der Wissenschaften of Vienna, and the Royal Danish Academy of Sciences of Copenhagen, presenting their publications.

Professor Horsford presented the following paper, offered to the Academy at a former meeting, and since revised and modified, " On the Value of the different Kinds of Prepared Vegetable Food," by John Dean.

" The following investigation, carried on in the laboratory of the Lawrence Scientific School, at the suggestion of Professor Horsford and under his direction, had for its object the determination of the nutritive values of the several kinds of prepared vegetable food found in our markets, particularly those allied in constitution to the starches, and is based on the amount of nitrogen contained in each. It is a well-known fact in physiological chemistry, that food to be nutritious must contain the ingredients necessary for the formation of the tissues and bones, as well as for the production of heat and formation of fat. The elements of which the tissues are formed are constantly undergoing changes, and the matter which at one time sustains vital activity is excreted, and replaced by new matter derived by means of the blood from the food. It is therefore necessary that food should contain the same substances or elements which are found in the different parts of the animal frame. These are carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, and some inorganic bases and salts. It is evident at a glance that they may be divided immediately into two classes, organic and inorganic. It is with the former class that we have chiefly to deal in the following pages. The organic class may be subdivided into bodies containing nitrogen, — with which are commonly associated, besides carbon, hydrogen, and oxygen, small quantities of sulphur and phosphorus, — and bodies containing no nitrogen, and conforming nearly to the formula of starch, $C_{12} H_{10} O_{10}$. We have thus divided the elements composing the animal frame, and consequently the elements of food, into three classes, each of which plays its individual part in the animal organism; — 1st. Bodies containing nitrogen, nitrogenous ingredients of food; such are albumen, gluten, &c. 2d. Non-nitrogenous bodies, starch, sugar, &c. 3d. Inorganic salts. These, as is well known, are of use in the following manner. The nitrogenous bodies enter into the composition of the tissues. Those containing no nitrogen contribute to form fat, and from their solution in the blood produce heat, their carbon being gradually burned by means of the oxygen inhaled by the lungs. Lastly, the inorganic salts assist in forming the bones, and enter into the composition of every organ of the body. Their values for the first-mentioned purpose have been the object of the following determinations.

" In regard to the specimens analyzed, they were taken in the marketable condition, and as it is often the case that tapioca, sago, and arrowroot are largely adulterated, care was taken to procure them of as good a quality as possible. The arrowroot, which is the most extensively adulterated of the three, was tested both by means of the vapor of iodine and the microscope, so that no doubt might exist of its being a pure article.

"The determinations were made in the following manner. The different specimens were dried in watch-glasses at a temperature of 100° C. (212° F.), and were all dried for the water determinations in their market condition, with the exception of maccaroni, which seemed likely to offer so much resistance to the escape of moisture, that it was pulverized previously to drying. They were then all pulverized, thoroughly dried at the same temperature (100° C.), and the determinations of carbon, hydrogen, and nitrogen made. The combustions for carbon and hydrogen were effected in the usual manner with oxide of copper, the portion of oxide of copper at the extremity of the tube being intimately mixed with very finely pulverized chlorate of potassa. The nitrogen was determined as ammonio-chloride of platinum by ignition with soda-lime, according to the method of Varrentrapp and Will. As the amount of nitrogen was exceedingly small in most of the specimens, it was supposed that the chloride of ammonium produced in the hydrochloric acid employed, by the absorption of ammonia from the air, might produce a perceptible effect upon the results of the analyses. Coincident determinations were therefore made with the hydrochloric acid in every analysis, by evaporating portions of acid and bichloride of platinum equal to those actually employed in determining the results of the combustions, collecting the precipitate on a weighed filter as usual, washing with alcohol, &c. It was found, however, in every case, that the filter lost more from washing with alcohol than it gained by the precipitate; it was therefore necessary to make a small addition, generally about 0.0014 grm. to the amount of ammonio-chloride of platinum obtained from the combustion. In making a statement of the results, the nitrogen was taken as the basis of the calculation; carbon, hydrogen, oxygen, and sulphur were distributed to it according to the proportions indicated by the formulæ of nitrogenous bodies. Albumen and gluten agree with each other so nearly in constitution, as given in the analyses of Scheerer (*Ann. der Chem. und Pharm.*, XL. 38), of Mulder, and of Rüling (*Ann. der Chem. und Pharm.*, LVIII. 310), that a single formula has been taken, namely, that of Mulder; —

Carbon = 53.5
Hydrogen = 7.0
Nitrogen = 15.5
Oxygen = 22.0
Sulphur = 1.6
Phosphorus = 0.4
100.0

The percentage of phosphorus being so small, it has been neglected in the estimations.

" The carbon computed by the foregoing formula, deducted from the total amount, afforded a basis for calculating the starch, and as the numerous experiments of Horsford and Krocker have shown so conclusively that the amount of starch may be accurately calculated in this way, no doubt can be reasonably felt with regard to the justice of so doing. Hydrogen and oxygen are accordingly distributed to the carbon, according to the formula $C_{12} H_{10} O_{10}$. This being done, a balance of hydrogen remained in every case. It was conceived that this was probably due to the fact that the starches cannot be deprived of all their moisture at 100° C.; part is also probably owing to moisture absorbed by the starch whilst weighing, as starch dried at 100° C. is exceedingly hygroscopic, " taking up in a few days exposed to the air 35 per cent. of moisture." (Knapp.) This hydrogen was therefore supplied with oxygen according to the formula of water. It will be seen by consulting the results, that the amount of moisture thus obtained is often quite large, and has a very considerable effect upon the averages. It is on this account, perhaps, somewhat to be regretted that the moisture was not determined at 120° or 125° C., instead of 100° C.

" No. I. Corn-Starch, No. 1.

" Corn-starch is prepared from maize or Indian corn, by the aid either of the ordinary method of steeping and fermenting, or else by steeping the corn, both before and after grinding, in a caustic or carbonated alkaline lye, the gluten remaining dissolved in the lye. This specimen was in the state of fine powder.

I. 0.869 grm. gave at 100° C. 0.1392 grm. loss.
II. 1.127 grm. dried at 100° C. left 0.0038 grm. ash.
III. 4.0347 grm. dried at 100° C. left 0.0133 grm. ash.
IV. 0.3124 grm. gave 0.5017 grm. CO_2 and 0.1857 grm. HO.

V. 0.4468 grm. gave 0.7246 grm. CO_2 and 0.271 grm. HO.
VI. 0.7073 grm. gave 0.0137 grm. $NH_4Cl. PtCl_2$.
VII. 1.9168 grm. gave 0.032 grm. $NH_4Cl. PtCl_2$.

Corresponding in 100 parts to

	I.	II.	Average.
Carbon	43.79	44.22	44.01
Hydrogen	6.60	6.74	6.67
Nitrogen	0.12	0.10	0.11
Ash	0.33	0.33	0.33
Water	16.01		16.01

Estimated according to the formulæ given, we have

Nitrogenous constituents,	Nitrogen	0.11	
	Carbon	0.38	
	Hydrogen	0.05	
	Oxygen	0.16	
	Sulphur	0.01	
			0.71
Non-nitrogenous constituents,	Carbon	43.63	
	Hydrogen	6.06	
	Oxygen	48.49	
			98.18
Water not expelled at 100° C.	Hydrogen	0.56	
	Oxygen	4.48	
			5.04
	Ash		0.33
			104.26

Reduced to an average percentage we obtain, —

	Dried at 100° C.	Fresh.
Nitrogenous constituents	0.69	0.58
Inorganic "	0.32	0.26
Starch, sugar, &c.	94.16	79.09
Water not expelled at 100° C., and accidental moisture	4.83	4.06
Water		16.01
	100.00	100.00

" No. II. CORN-STARCH, No. 2.

" This specimen differed from No. 1 in being made into lumps in the state in which wheat-starch is usually sold; it yielded nearly three times as much nitrogen as No. 1, and was therefore not so pure a starch, but better fitted for the purposes of nutrition. Of its manufacture, I was unable to obtain any information.

I. 3.1531 grm. lost at 100° C. 0.3748 grm.
II. 2.508 grm. dried at 100° C. gave 0.011 grm. ash.
III. 0.3189 grm. gave 0.508 grm. CO_2 and 0.187 grm. HO.
IV. 1.2677 grm. gave 0.0761 grm. $NH_4Cl.\ PtCl_2$.

Corresponding in 100 parts to

	I.
Carbon	43.44
Hydrogen	6.51
Nitrogen	0.38
Ash	0.43
Water	11.88

Estimated as above, we have

Nitrogenous constituents,	Nitrogen	0.38	
	Carbon	1.31	
	Hydrogen	0.17	
	Oxygen	0.53	
	Sulphur	0.04	
			2.43
Non-nitrogenous constituents,	Carbon	42.13	
	Hydrogen	5.85	
	Oxygen	46.81	
			94.79
Water not expelled at 100° C.	Hydrogen	0.49	
	Oxygen	3.92	
			4.41
	Ash		0.43
			102.06

Reduced to an average percentage, we obtain

	Dried at 100° C.	Fresh.
Nitrogenous constituents	2.38	2.10
Inorganic "	0.42	0.37
Starch, sugar, &c.	92.88	81.84
Water not expelled at 100° C., and accidental moisture	4.32	3.81
Water		11.88
	100.00	100.00

“ No. III. Tapioca.

“ Tapioca is a modification of starch, being partially converted into gum by heating. It is prepared from the root of the *Jatropha manihot*, found in the West Indies, South America, and Africa. The roots are washed, reduced to pulp, and subjected to strong pressure, by which means they are deprived of nearly all their highly poisonous juice. As the active principle of this juice is volatile, it is entirely dissipated by baking the pulp upon iron plates. The pulp thus prepared is hard and friable, and is easily broken into lumps, which are laid in the sun to dry. In this state it is known by the name of *cassava*. It is purified by being stirred up with water and filtered through linen; the liquid is then boiled down over a fire, being constantly kept in agitation. As the water evaporates the starch thickens, and finally becomes granulated, when it must be dried over a stove. A tolerably good imitation of it is made by treating potato-starch in a similar manner.

I. 1.0577 grm. lost at 100° C. 0.1409 grm.
II. 1.383 grm. dried at 100° C. left 0.0016 grm. ash.
III. 3.8196 grm. dried at 100° C. left 0.0048 grm. ash.
IV. 0.3669 grm. gave 0.5896 grm. CO_2 and 0.214 grm. HO.
V. 0.3611 grm. gave 0.5774 grm. CO_2 and 0.2118 grm. HO.
VI. 2.3044 grm. gave 0.041 grm. $NH_4Cl. PtCl_2$.

Corresponding in 100 parts to

	I.	II.	Average.
Carbon	43.79	43.61	43.70
Hydrogen	6.48	6.51	6.49
Nitrogen	0.10		0.10
Ash	0.12	0.12	0.12
Water	13.32		13.32

Estimated in 100 parts, we obtain the following numbers: —

Nitrogenous constituents,	Nitrogen	0.10	
	Carbon	0.34	
	Hydrogen	0.04	
	Oxygen	0.13	
	Sulphur	0.01	
			0.62
Non-nitrogenous constituents,	Carbon	43.36	
	Hydrogen	6.02	
	Oxygen	48.19	
			97.57
Water not expelled at 100° C.	Hydrogen	0.43	
	Oxygen	3.44	
			3.87
	Ash		0.12
			102.18

Reduced to percentage, we obtain

	Dried at 100° C.	Fresh.
Nitrogenous constituents	0.61	0.53
Inorganic "	0.11	0.09
Starch, sugar, &c.	95.49	82.77
Water not expelled at 100° C., and accidental moisture	3.79	3.29
Water		13.32
	100.00	100.00

" No. IV. ARROWROOT.

" Arrowroot is a very pure starch, prepared in the West Indies from the roots of the *Marantha arundinacea* and *indica*. The starch is contained in the tubers, in numerous very minute cells. It has been cultivated with the greatest success upon the Hopewell estate, in the island St. Vincent, where it often grows to the height of three feet, and sends out tap-roots to the depth of eighteen inches; the preparation is as follows: — ' The carefully skinned tubers are washed, then ground in a mill, and the pulp washed in tinned copper cylindrical washing-machines. The fecula is subsequently dried in drying-houses. In order to obtain the fecula free from impurity, pure water must be used, and great care and attention paid in every step of the process. The skinning or peeling of the tubers must be performed with great nicety, as the cuticle contains a resinous matter, which imparts color and a disagreeable flavor to the starch. German-silver palettes are used for skinning the deposited fecula, and shovels of the same metal are used for packing the dried fecula. The drying is effected in pans covered by white gauze, to exclude dust and insects.' (Pereira.)

I. 4.4838 grm. lost at 100° C. 0.7404 grm.
II. 3.6005 grm. dried at 100° C. left 0.0077 grm. ash.
III. 0.3978 grm. gave 0.6325 grm. CO_2 and 0.2286 grm. HO.
IV. 0.3908 grm. gave 0.6209 grm. CO_2 and 0.2258 grm. HO.
V. 1.3125 grm. gave 0.03 grm. $NH_4Cl. PtCl_2$.

Corresponding in 100 parts to

	I.	II.	Average.
Carbon	43.37	43.33	43.35
Hydrogen	6.39	6.42	6.40
Nitrogen	0.14		0.14
Ash	0.21		0.21
Water	16.51		16.51

Estimated as above, we obtain

Nitrogenous constituents,	Nitrogen	0.14	
	Carbon	0.49	
	Hydrogen	0.06	
	Oxygen	0.19	
	Sulphur	0.01	
			0.89
Non-nitrogenous constituents,	Carbon	42.86	
	Hydrogen	5.95	
	Oxygen	47.63	
			96.44
Water not expelled at 100° C.	Hydrogen	0.39	
	Oxygen	3.12	
			3.51
	Ash		0.21
			101.05

Reduced to percentage, we obtain

	Dried at 100° C.	Fresh.
Nitrogenous constituents	0.88	0.73
Inorganic "	0.21	0.18
Starch, sugar, &c.	95.44	79.68
Water not expelled at 100° C., and accidental moisture	3.47	2.90
Water		16.51
	100.00	100.00

" No. V. SAGO.

" Sago is a variety of starch extracted from the pith of palms, many species of which are capable of yielding it. Amongst these are *Sagus Rumphii*, *Cicas inermis* and *revoluta*, *Coryota urens*, *Borassus Gomato*, and several species of Zamia, Corypha, and Mauritia. The starch is obtained from the pith, which constitutes nearly the entire body of the stem of these palms. A single stem is said to yield three cwt. of sago. The stem is cleft open, and the starch collected, washed upon sieves, and purified by elutriation with water in vats; the granulation is performed by forcing the starch through sieves in such a manner that the lumps shall fall upon a hot plate of copper. Each lump is converted into paste, the granules of starch swell up and dry into the irregular, roundish masses, about the size of small shot, which constitute the sago in its market condition.

" Sago is sometimes fraudulently imitated with potato-starch, but this has a greater tendency to become pasty when boiled. ‘The essential property of sago consists in its swelling up in hot water or soup without melting, the separate little lumps remaining entire, and forming translucent, stiffly gelatinous, but not slimy globules. Six varieties of sago are distinguished by Planche.’ (Knapp.)

I. 3.118 grm. lost at 100° C. 0.4001 grm.
II. 2.5906 grm. dried at 100° C. left 0.005 grm. ash.
III. 0.3791 grm. gave 0.6052 grm. CO_2 and 0.2128 grm. HO.
IV. 0.3588 grm. gave 0.574 grm. CO_2 and 0.2063 grm. HO.
V. 1.1509 grm. gave 0.0256 grm. $NH_4Cl.\ PtCl_2$.
VI. 1.1313 grm. gave 0.026 grm. $NH_4Cl.\ PtCl_2$.

Corresponding in 100 parts to

	I.	II.	Average.
Carbon	43.53	43.63	43.58
Hydrogen	6.24	6.38	6.31
Nitrogen	0.12	0.14	0.13
Ash	0.19		0.19
Water	12.83		12.83

Estimated as before, we have

Nitrogenous constituents,	Nitrogen	0.13	
	Carbon	0.45	
	Hydrogen	0.06	
	Oxygen	0.18	
	Sulphur	0.01	
			0.83
Non-nitrogenous constituents,	Hydrogen	5.99	
	Carbon	43.13	
	Oxygen	47.92	
			97.04
Water not expelled at 100° C.	Hydrogen	0.26	
	Oxygen	2.08	
			2.34
	Ash		0.19
			100.40

Reduced to an average percentage, we obtain

	Dried at 100° C.	Fresh.
Nitrogenous constituents	0.83	0.72
Inorganic "	0.19	0.17
Starch, sugar, &c.	96.65	84.25
Water not expelled at 100° C., and accidental moisture	2.03	2.03
Water		12.83
	100.00	100.00

“No. VI. Wheat-Starch.

“This was introduced chiefly for the sake of comparing it with the other starches. All the principal facts regarding its manufacture are too well known to require enumeration.

I. 2.3346 grm. lost at 100° C. 0.2634 grm.
II. 1.8624 grm. dried at 100° C. left 0.0098 grm. ash.
III. 0.3758 grm. gave 0.6062 grm. CO_2 and 0.2165 grm. HO.
IV. 0.3502 grm. gave 0.5661 grm. CO_2 and 0.2098 grm. HO.
V. 1.7456 grm. gave 0.0516 grm. $NH_4Cl.\ PtCl_2$.

Corresponding in 100 parts to

	I.	II.	Average.
Carbon	43.99	44.08	44.04
Hydrogen	6.41	6.65	6.53
Nitrogen	0.18		0.18
Ash	0.53		0.53
Water	11.28		11.28

Estimated as before, we have

Nitrogenous constituents,	Nitrogen	0.18	
	Carbon	0.62	
	Hydrogen	0.08	
	Oxygen	0.25	
	Sulphur	0.02	
			1.15
Non-nitrogenous constituents,	Carbon	43.42	
	Hydrogen	6.03	
	Oxygen	48.24	
			97.69
Water not expelled at 100° C.	Hydrogen	0.42	
	Oxygen	3.36	
			3.78
	Ash		0.53
			103.15

Reduced to average percentage, we have

	Dried at 100° C.	Fresh.
Nitrogenous ingredients	1.12	0.99
Inorganic	0.51	0.45
Starch, sugar, &c.	94.71	84.03
Water not expelled at 100° C. and accidental moisture	3.66	3.25
Water		11.28
	100.00	100.00

" No. VII. Rice Flour.

I. 1.5265 grm. lost at 100° C. 0.2139 grm.
II. 1.2604 grm. dried at 100° C. left 0.0063 grm. ash.
III. 0.4318 grm. gave 0.6924 grm. CO_2 and 0.2477 grm. HO.
IV. 0.347 grm. gave 0.5566 grm. CO_2 and 0.197 grm. HO.
V. 1.1169 grm. gave 0.2064 grm. $NH_4Cl. PtCl_2$.
VI. 0.6989 grm. gave 0.1577 grm. $NH_4Cl. PtCl_2$.

Corresponding in 100 parts to

	I.	II.	Average.
Carbon	43.75	43.75	43.75
Hydrogen	6.37	6.30	6.33
Nitrogen	1.40	1.15	1.28
Ash	0.49		0.49
Water	14.01		14.01

Estimated according to the formula as before, we obtain

Nitrogenous constituents,	Nitrogen	1.28	
	Carbon	4.42	
	Hydrogen	0.58	
	Oxygen	1.82	
	Sulphur	0.13	
			8.23
Non-nitrogenous constituents,	Carbon	39.33	
	Hydrogen	5.46	
	Oxygen	43.69	
			88.48
Water not expelled at 100° C.	Hydrogen	0.29	
	Oxygen	2.32	
			2.61
	Ash		0.49
			99.81

Reduced to percentage, we obtain

	Dried at 100° C.	Fresh.
Nitrogenous constituents	8.24	7.09
Inorganic "	0.49	0.42
Starch, sugar, &c.	88.65	76.23
Water not expelled at 100° C. and accidental moisture	2.62	2.25
Water		14.01
	100.00	100.00

" No. VIII. Maccaroni.

" Maccaroni is a dough prepared from fine wheat-flour, made into a tubular form about the thickness of a goose-quill. It is prepared to most advantage from the hard Italian wheat, which is richer in gluten than the wheat of more northern countries. This is ground into a coarse flour by means of light millstones, and is made into a paste with hot water. The Italians pile up the pieces of dough one upon another, and tread it well with their feet for two or three minutes. When the dough is properly kneaded, it is placed in a cast iron cylinder, which is kept warm in order to render the dough thin and plastic ; it is then forced through holes in the bottom of the cylinder, which give it the shape of fillets or ribbons, the edges of which are joined together, forming the paste into tubes. It is finally dried in the sun.

I. 2.7108 grms. lost at 100° C. 0.2684 grm.
II. 2.807 grms. dried at 100° C. left 0.0276 grm. ash.
III. 0.3666 grm. gave 0.6141 grm. CO_2 and 0.2169 grm. HO.
IV. 0.3452 grm. gave 0.5773 grm. CO_2 and 0.2048 grm. HO.
V. 1.015 grm. gave 0.2599 grm. $NH_4Cl. PtCl_2$.
VI. 1.1739 grm. gave 0.2856 grm. $NH_4Cl. PtCl_2$.

Corresponding in 100 parts to

	I.	II.	Average.
Carbon	45.69	45.58	45.64
Hydrogen	6.58	6.59	6.58
Nitrogen	1.60	1.49	1.55
Ash	0.98		0.98
Water	9.90		9.90

Estimated as above, we obtain

Nitrogenous constituents,	Nitrogen	1.55	
	Carbon	5.35	
	Hydrogen	0.70	
	Oxygen	2.20	
	Sulphur	0.16	
			9.96
Non-nitrogenous constituents,	Carbon	40.29	
	Hydrogen	5.59	
	Oxygen	44.77	
			90.65
Water not expelled at 100° C.	Hydrogen	0.29	
	Oxygen	2.32	
			2.61
	Ash		0.98
			104.20

Estimated in 100 parts, we have

	Dried at 100° C.	Fresh.
Nitrogenous constituents	9.56	8.61
Inorganic "	0.95	0.86
Starch, sugar, &c.	86.99	78.38
Water not expelled at 100° C., and accidental moisture	2.50	2.25
Water		9.90
	100.00	100.00

" No. IX. PREPARED POTATO.

" The specimen analyzed was finely divided, dried potato, prepared for transportation, use on sea-voyages, &c. Of the details of its manufacture, I was unable to obtain any information.

I. 2.3378 grms. lost at 100° C. 0.2354 grm.
II. 2.1046 grms. dried at 100° C. left 0.0842 grm. ash.
III. 0.4042 grm. gave 0.6415 grm. CO_2 and 0.221 grm. HO.
IV. 0.2933 grm. gave 0.4623 grm. CO_2 and 0.1614 grm. HO.
V. 0.6696 grm. gave 0.1800 grm. $NH_4Cl. PtCl_2$.
VI. 0.7431 grm. gave 0.1912 grm. $NH_4Cl. PtCl_2$.

Corresponding in 100 parts to

	I.	II.	Average.
Carbon	43.28	42.99	43.14
Hydrogen	6.07	6.11	6.09
Nitrogen	1.67	1.60	1.63
Ash	4.00		4.00
Water	10.07		10.07

Estimated as before, we obtain

Nitrogenous constituents,	Nitrogen	1.63	
	Carbon	6.28	
	Hydrogen	0.73	
	Oxygen	2.31	
	Sulphur	0.16	11.11
Non-nitrogenous constituents,	Carbon	36.86	
	Hydrogen	5.12	
	Oxygen	40.95	82.93
Water not expelled at 100° C.	Hydrogen	0.24	
	Oxygen	1.92	2.16
	Ash		4.00
			100.20

Estimated in 100 parts, we have

	Dried at 100° C.	Fresh.
Nitrogenous constituents	11.09	9.97
Inorganic "	3.99	3.59
Starch, sugar, &c.	82.77	74.44
Water not expelled at 100° C., and accidental moisture	2.15	1.93
Water		10.07
	100.00	100.00

"No. X. Farina.

"Farina is prepared both from corn and wheat, and is in rounded grains resembling sago in appearance, only smaller. Although I made many inquiries, I was unable to obtain any information respecting its preparation from the manufacturers. It is perhaps prepared by washing out a portion of the starch from the finely ground meal, and drying and granulating the residue. The specimen analyzed was prepared from corn. It seems to have less starch and about the same amount of nitrogenous ingredients as Indian-corn meal, an analysis of which by Professor Horsford (Phil. Mag., S. 3. XXIX. 365) gave as follows: Starch 84.90; nitrogenous ingredients 13.65. Farina gives: Starch 81.76; nitrogenous ingredients 13.61.

I. 3.794 grms. lost at 100° C. 0.3908 grm.
II. 3.403 grms. dried at 100° C. left 0.0176 grm. ash.
III. 0.341 grm. gave 0.5461 grm. CO_2 and 0.1988 grm. HO.
IV. 0.4322 grm. gave 0.6919 grm, CO_2 and 0.2583 grm. HO.
V. 0.4434 grm. gave 0.1506 grm. $NH_4Cl. PtCl_2$.

Corresponding in 100 parts to

	I.	II.	Average.
Carbon	43.67	43.66	43.66
Hydrogen	6.45	6.64	6.54
Nitrogen	2.12		2.12
Ash	0.51		0.51
Water	10.30		10.30

Estimated as before, we obtain

Nitrogenous constituents,	Nitrogen	2.12	
	Carbon	7.32	
	Hydrogen	0.96	
	Oxygen	3.00	
	Sulphur	0.21	
			13.61
Non-nitrogenous constituents,	Carbon	36.34	
	Hydrogen	5.05	
	Oxygen	40.37	
			81.76
Water not expelled at 100° C.	Hydrogen	0.53	
	Oxygen	4.24	
			4.77
	Ash		0.51
			100.65

Reduced to an average, we have

	Dried at 100° C.	Fresh.
Nitrogenous ingredients	13.52	12.13
Inorganic "	0.51	0.46
Starch, sugar, &c.	81.23	72.86
Water not expelled at 100° C., and accidental moisture	4.74	4.25
Water		10.30
	100.00	100.00

1. *Tabular Results of Analyses.*

	Nitrogen.	Carbon.	Hydrogen.	Oxygen.	Sulphur.	Ash.
Corn-Starch, No. 1,	0.11	44.01	6.67	53.13	0.01	0.33
" No. 2,	0.38	43.44	6.51	51.26	0.04	0.43
Tapioca,	0.10	43.70	6.49	51.76	0.01	0.12
Arrowroot,	0.14	43.35	6.40	50.94	0.01	0.21
Sago,	0.13	43.58	6.31	50.18	0.01	0.19
Wheat-Starch,	0.18	44.04	6.53	51.85	0.02	0.53
Rice Flour,	1.28	43.75	6.33	47.83	0.13	0.49
Maccaroni,	1.55	45.64	6.58	49.29	0.16	0.98
Prepared Potato,	1.63	43.14	6.09	44.18	0.16	4.00
Farina,	2.12	43.66	6.54	47.61	0.21	0.51

2. *Tabular View of the Nitrogenous Constituents.*

	Nitrogenous Constituents.		Water.
	Dried at 100° C.	Fresh.	
Corn-Starch, No. 1,	0.71	0.60	16.01
" " " 2,	2.43	2.14	11.88
Tapioca,	0.62	0.53	13.32
Arrowroot,	0.89	0.73	16.51
Sago,	0.83	0.72	12.83
Wheat-Starch,	1.15	1.02	11.28
Rice Flour,	8.23	7.08	14.01
Maccaroni,	9.96	9.01	9.90
Prepared Potato,	11.11	9.98	10.07
Farina,	13.61	12.21	10.30

3. *Table for the Starch.*

	Dried at 100° C.	Fresh.
Corn-Starch, No. 1,	98.18	83.08
" " " 2,	94.79	83.75
Tapioca,	97.57	84.85
Arrowroot,	96.44	80.68
Sago,	97.04	84.61
Wheat-Starch,	97.69	87.01
Rice Flour,	88.48	76.06
Maccaroni,	90.65	82.04
Prepared Potato,	82.93	74.60
Farina,	81.76	73.39

4. *Table of Equivalents or Weights for an Equal of Nutritive Power.* — *Arrowroot at* 100.

	Dried at 100° C.	Fresh.
Corn-Starch, No. 1,	125.3	121.6
" " " 2,	36.6	34.1
Tapioca,	143.5	137.7
Arrowroot,	100.0	100.0
Sago,	107.2	101.4
Wheat-Starch,	77.4	72.1
Rice Flour,	10.8	10.3
Maccaroni,	8.9	8.1
Prepared Potato,	8.0	7.3
Farina,	6.5	5.9

" The tables given were all of them calculated from the direct results of the different analyses, and not from the average per cent. statements. By comparing the results of the determinations as given in the above tables, we shall arrive at the following conclusions.

" A much larger amount of starch is contained in all the specimens analyzed, than of nitrogenous constituents. Food, to be properly constituted, should contain the elements which support respiration and furnish fat, as well as those which form the tissues. We shall, however, see, by comparing tables 2 and 3, that the proportions of starch differ very much less when compared with each other, than the nitrogenous ingredients do. The proportions of starch in the first six and last four specimens are about equal to each other, whilst we have in Farina twenty times as great a quantity of nitrogenous constituents as in Corn-Starch No. 1, or Tapioca. I have, therefore, in the last table, given the nutritive powers of the different specimens based upon the amount of the nitrogenous constituents, the starch being nearly enough equal in all to compute their nutritive power upon the nitrogen alone. Arrowroot was taken as the standard. 127.5 parts of corn-starch are required to equal in nutritive power 100 parts of arrowroot, &c.

" We shall also see, —

" That the specimens analyzed may be divided into two classes, according to their relative quantity of nitrogen. The first of which will include the starches; the second, farina, maccaroni, rice flour, and prepared potato.

" That the members of the second class are very much better fitted for nutrition than those of the first class, farina being sixteen times as nutritious as arrowroot, and twenty-three times more nutritious than tapioca.

" That the members of the second class contain, with the exception of rice, less moisture than the first.

" That two specimens of corn-starch may differ from each other largely, one containing three times as much nitrogen as the other.

" That the members of the first group contain from one sixth to one ninth their total weight of moisture which may be expelled at 100° C.; those of the second, from one seventh to one tenth.

" With regard to the ashes we find, —

" That potato, dried at 100° C., gives over four times as much ash as any other specimen analyzed.

"That the ashes of corn-starch and farina are chiefly composed of alkalies, and give little or no reaction for carbonic acid.

"That all the ashes contain iron. The ash of Corn-Starch No. 1 also gave a distinct reaction for manganese.

"Finally, as different specimens of the same article of food may differ in constitution on account of variety in the soil or in the mode of preparation (which latter was probably the cause of the marked difference between the two specimens of corn-starch), these determinations cannot be taken as giving an absolute standard of nutritive value, but only as affording a probable index of results and a means of comparison of the nutritive powers of each."

Professor Horsford also exhibited specimens of the metal Aluminum, to show its malleability, silver lustre, and other physical properties. It was first obtained by Sir Humphrey Davy, and has recently been prepared by Wöhler's method on a more extended scale by Deville of Paris. It is obtained from common alum most conveniently, from 100 parts of which about 5.78 parts of aluminum can be obtained by a very expensive process; it is made by decomposing the chloride of aluminum by potassium or sodium. Its weight is 2.56.

Professor Gray presented the following paper, entitled, "Characters of New Genera of Plants, mostly from Polynesia, in the Collection of the United States Exploring Expedition, under Captain Wilkes (continued)."

"ACICALYPTUS, Nov. Gen. Myrtacearum.

"Calyx subulæformis, acute tetragonus, clausus; apice subulato-rostrato operculiformi sub anthesi circumscisse deciduo; fauce ultra ovarium longe producta. Petala 4, in operculum leviter cohærentia, sub anthesi dejecta. Stamina plurima, discreta, margini calycis tubi inserta: filamenta filiformia; antheræ biloculares, loculis ovalibus. Stylus filiformis: stigma obtusum. Ovarium biloculare, dissepimento tenui. Ovula in loculis 8 – 10, anatropa, subcurvata? (Fructus ignotus, forte carnosus indehiscens.) — Arbor vel arbuscula; foliis oppositis ovatis penninerviis impunctatis; floribus cymosis terminalibus.

"ACICALYPTUS MYRTOIDES. — Feejee Islands.

" SPIRÆANTHEMUM, Nov. Gen. Saxifragacearum.

" Flores polygamo-dioici, vel hermaphroditi. Calyx quadri-quinquefidus, æstivatione valvatus, persistens. Corolla nulla. Stamina 8 vel 10, imæ basi calycis inserta, fere hypogyna: filamenta filiformia, fl. masc. exserta, hermaphrodito-fert. calyce haud longiora: antheræ didymæ, biloculares, longitudinaliter dehiscentes. Squamulæ disci hypogynæ fl. masc. 4 vel 5, subcoalitæ, apice dentatæ ; fl. fert. 8 vel 10, staminibus alternæ, sæpe emarginatæ. Ovaria maris nulla ; fœm. 4 vel 5, discreta, libera, calycis lobis alterna, ovoideo-fusiformia, in stylos breves attenuata ; stigmata terminalia subcapitata. Ovula gemina collateralia, vel solitaria, pendula, subanatropa. Folliculi 4 – 5, compressi, cartilaginei vel coriacei, intus longitudinaliter dehiscentes, mono – dispermi. Semina oblonga, compressa; testa membranacea aut superne aut utrinque alato-producta. Embryo subcylindricus, albumine carnoso parum brevior; cotyledonibus oblongis planiusculis radicula supera dimidio brevioribus. — Frutices vel arbusculæ Polynesicæ ; foliis oppositis seu verticillatis simplicibus ; stipulis interpetiolaribus deciduis; floribus parvis paniculatis ; pedicellis articulatis.

" 1. SPIRÆANTHEMUM SAMOENSE (sp. nov.) : ramis pubescentibus ; foliis oppositis ovalibus subacuminatis basi rotundatis serratis insigniter penninerviis ; paniculis folia excedentibus ; folliculis dispermis ; seminibus utrinque appendiculatis. — Samoan or Navigators' Islands.

" 2. SPIRÆANTHEMUM VITIENSE (sp. nov.) : glabrum ; foliis oppositis et verticillatis obovato-ellipticis oblongisve obtusis basi attenuatis integerrimis paucivenosis paniculas excedentibus ; folliculis monospermis ; semine superne alato. — Feejee Islands.

" REYNOLDSIA, Nov. Gen. Araliacearum.

" Flores polygami. Calyx basi nudus ; tubo cum ovario connato ; limbo brevissimo integerrimo vel subrepando. Petala 8 – 10, epigyna, valvata, apice in calyptræ formam coalita, sub anthesi dejecta. Stamina 8 – 10, cum petalis inserta, iisdem alterna : filamenta brevia : antheræ lineares. Ovarium inferum, 8 – 17 loculare : stylus nullus vel subnullus : stigma indivisum, 8 – 18-radiatum. Ovula in loculis solitaria, suspensa, anatropa. Drupa baccata, globosa, 8 – 18-pyrena ; pyrenis cartilagineis. Embryo in apice albuminis dense carnosi minutus ; radicula supera cylindrica. — Arbores insularum Pacifici, glabræ, inermes, exstipulatæ ; foliis simpliciter pinnatis sæpissime trijugis cum impari, foliolis subdentatis; umbellis racemisve compositis paniculatis laxifloris.

"1. REYNOLDSIA SANDWICENSIS (sp. nov.): foliolis subcordatis; corolla clausa oblonga: stigmate 8–10-radiato; drupa 8–10-pyrena. — Sandwich Islands.

"2. REYNOLDSIA PLEIOSPERMA (sp. nov.): foliolis ovatis seu lanceolato-oblongis; corolla clausa conica vel ovoidea; stigmate 15–18-radiato; drupa 15–18-pyrena. — Samoan Islands.

"TETRAPLASANDRA, Nov. Gen. Araliacearum.

"Flores polygami? Calyx tubo hemisphærico cum ovario connato; limbo brevissimo truncato vix denticulato. Petala 7–8, epigyna, valvata, leviter calyptratim cohærentia, caduca. Stamina cum petalis inserta, iisdem numero quadrupla, nempe 28 v. 32, uniseriata: filamenta brevia: antheræ oblongæ, subsagittatæ. Ovarium 7–10-loculare: stylus nullus: stigma indivisum, obsolete 7–10-radiatum, stylopodio brevi conico impositum. Ovula in loculis solitaria, suspensa, anatropa. Drupa baccata, 8–10-pyrena; pyrenis coriaceis. (Embryo haud visus.) — Arbor procera, inermis; foliis exstipulatis pinnatis 5–7-foliolatis subtus incanis; umbellis decompositis paniculatis.

"TETRAPLASANDRA HAWAIENSIS. — Hawaii, Sandwich Islands.

"PLERANDRA, Nov. Gen. Araliacearum.

"Flores polygamo-monoici vel dioici? *Masc.* Calyx tubo turbinato cum ovario connato; limbo brevissimo post anthesin repando-undulato. Petala 4? epigyna, oblonga, æstivatione valvata, mox decidua. Stamina indefinita, epigyna, pluriserialia: filamenta filiformia: antheræ oblongæ. Ovarium 14–15-loculare; ovula in loculiis solitaria, parva, suspensa, sæpius abortiva vel nulla. Stigma truncatum, obsolete multiradiatum, stylopodio conico impositum. *Fœm.* ignoti. — Arbor 20-pedalis, macrophylla; foliis digitatis 9-foliolatis; umbellis compositis.

"PLERANDRA PICKERINGII. — Feejeė Islands."